The Consultative Committee for Space Data Systems

Draft Recommendation for
Space Data System Practices

SPACECRAFT ONBOARD INTERFACE SERVICES—SUBNETWORK DEVICE DISCOVERY SERVICE

DRAFT RECOMMENDED PRACTICE

CCSDS 854.0-R-1

RED BOOK

June 2007

AUTHORITY

Issue:	Red Book, Issue 1
Date:	June 2007
Location:	Not Applicable

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CCSDS Secretariat
Office of Space Communication (Code M-3)
National Aeronautics and Space Administration
Washington, DC 20546, USA

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FOREWORD

(WHEN THIS RECOMMENDED PRACTICE IS FINALIZED, IT WILL CONTAIN THE FOLLOWING FOREWORD:)

This document is a technical **Recommended Practice** for use in developing flight and ground systems for space missions and has been prepared by the **Consultative Committee for Space Data Systems** (CCSDS). The *Subnetwork Device Discovery Service* described herein is intended for missions that are cross-supported between Agencies of the CCSDS, in the framework of the Spacecraft Onboard Interface Services (SOIS) CCSDS area.

This **Recommended Practice** specifies a service to be used by space missions to identify the presence of subnetwork data systems. The SOIS Subnetwork Device Discovery Service is a simple service which is provided by data link-specific mechanisms within the subnetwork layers. The service may be invoked by a subnetwork user entity or by mechanisms internal to the subnetwork (e.g., when a device is first connected to the subnetwork). The SOIS Subnetwork Device Discovery Service provides a common service interface regardless of the particular type of data link being used for communication.

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PREFACE

This document is a draft CCSDS Recommended Practice. Its draft status indicates that the CCSDS believes the document to be technically mature and has released it for formal review by appropriate technical organizations. As such, its technical contents are not stable, and several iterations of it may occur in response to comments received during the review process.

Implementers are cautioned **not** to fabricate any final equipment in accordance with this document's technical content.

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 854.0-R-1	Spacecraft Onboard Interface Services—Subnetwork Device Discovery Service, Draft Recommended Practice, Issue 1	June 2007	Current draft

CONTENTS

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document comprises an output of the Spacecraft Onboard Interface Services (SOIS) Area of the Consultative Committee for Space Data Systems. It is one of a family of documents specifying the SOIS-compliant services to be provided by onboard subnetworks.

The purpose of this document is to define services and service interfaces provided by the SOIS Subnetwork Device Discovery Service. Its scope is to specify the service only and not to specify methods of providing the service over a variety of onboard data links.

1.2 APPLICABILITY

This document applies to any mission or equipment claiming to provide a CCSDS SOIS-compliant Subnetwork Device Discovery Service.

1.3 RATIONALE

SOIS provide service interface specifications in order to promote interoperability and development reuse via peer-to-peer and vertical standardisation.

1.4 DOCUMENT STRUCTURE

The document has five major sections:

- this section, containing administrative information, definitions and references;
- section 2, describing general concepts and assumptions;
- section 3, containing the Subnetwork Device Discovery Service specification;
- section 4, containing the Management Information Base (MIB) for the service;
- section 5, comprising a Service Conformance Statement Proforma.

In addition, annex A contains informative references.

1.5 CONVENTIONS AND DEFINITIONS

1.5.1 BIT NUMBERING CONVENTION AND NOMENCLATURE

In accordance with modern data communications practice, spacecraft data fields are often grouped into eight-bit ‘words’ widely known as bytes. Throughout this Recommended Practice, such an eight-bit word is called an ‘octet’. The numbering for octets within a data structure starts with zero.

By CCSDS convention, any ‘spare’ bits shall be permanently set to ‘0’.

1.5.2 DEFINITIONS

1.5.2.1 General

Within the context of this document the following definitions apply.

1.5.2.2 Definitions from the Open Systems Interconnection (OSI) Basic Reference Model

This document is defined using the style established by the Open Systems Interconnection (OSI) Basic Reference Model (reference [1]). This model provides a common framework for the development of standards in the field of systems interconnection.

The following terms, used in this Recommended Practice, are adapted from definitions given in reference [2]:

Layer: A subdivision of the architecture, constituted by subsystems of the same rank.

Protocol Data Unit (PDU): A unit of data specified in a protocol and consisting of protocol-control information and possibly user data.

Service: A capability of a layer (service provider) together with the layers beneath it, which is provided to the service users.

Service Data Unit (SDU): An amount of information whose identity is preserved when transferred between peer entities in a given layer and which is not interpreted by the supporting entities in that layer.

1.5.2.3 Terms Defined in this Recommended Practice

For the purposes of this Recommended Practice, the following definitions also apply. Many other terms that pertain to specific items are defined in the appropriate sections.

Channel: An identifier for network resources associated with a resource reservation. May be a list of time slots in a time division multiplexed system or a bandwidth limit in a bandwidth division multiplexed system. The subnetwork resources required for the communication may also be defined to allow simultaneous use of non-conflicting resources on subnetworks that support this feature.

Octet: An eight-bit word commonly referred to as a byte.

Priority: The transmit precedence of an SDU relative to other SDUs.

Quality of Service (QoS): The ability of a communication system to provide predictable and

differentiated services. Quality of Service for a communication service may be characterised in terms of important features relevant to that communications service, for example: Reliability, Transmission rate, Effective Bandwidth and latency, Error rate.

Service Access Point (SAP): Within the subnetwork, a SOIS Subnetwork Service Access Point. As a minimum it locates a data system and a subnetwork user entity within that data system.

1.6 HOW THIS DOCUMENT FITS INTO THE SOIS DOCUMENTATION TREE

This document conforms to the principles set out in the Spacecraft Onboard Interface Services Green Book (reference [A1]) and should not be applied without first consulting this reference. The protocols which provide this service are to be documented for individual links, and this may be in the purview of individual missions, agencies or of CCSDS depending on future circumstance.

1.7 DOCUMENT NOMENCLATURE

The following conventions apply throughout this Recommended Practice:

a) The words ‘shall’ and ‘must’ imply a binding and verifiable specification;

b) The word ‘should’ implies an optional, but desirable, specification;

c) The word ‘may’ implies an optional specification;

d) The words ‘is’, ‘are’, and ‘will’ imply statements of fact.

1.8 REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommended Practice. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommended Practice are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Documents.

[1] *Information Technology—Open Systems Interconnection—Basic Reference Model: The Basic Model*. International Standard, ISO/IEC 7498-1:1994. 2nd ed. Geneva: ISO, 1994.

[2] *Information Technology—Open Systems Interconnection—Basic Reference Model—Conventions for the Definition of OSI Services*. International Standard, ISO/IEC 10731:1994. Geneva: ISO, 1994.

[3] *Space Link Identifiers*. Recommendation for Space Data System Standards, CCSDS 135.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, October 2006.

NOTE – Informative references are contained in annex A.

2 OVERVIEW

2.1 FUNCTION

The SOIS Subnetwork Device Discovery Service provides a means for a user entity to receive notification of data systems' presence on the subnetwork.

2.2 CONTEXT

The SOIS Subnetwork Layer provides the Device Discovery Service to user applications. The service may be provided over a variety of data links and the method of such provision is not in the scope of this document.

As shown in figure 2-1, the service is one of a number of services which may be provided by the SOIS Subnetwork.

The Subnetwork Device Discovery Service makes use of the data link to transfer data and control information. A variety of data links may be suited to provision of the service and the strategy for such service provision is outlined in reference **Error! Reference source not found.**.

The Device Discovery Service can be invoked either by a subnetwork user entity or by mechanisms internal to the subnetwork. The recipient of the Device Discovery Service data is always the subnetwork user entity. In the case of service invocation by a user entity the recipient of the Device Discovery Service data will be the same user entity. The method of service provision is data-link specific.

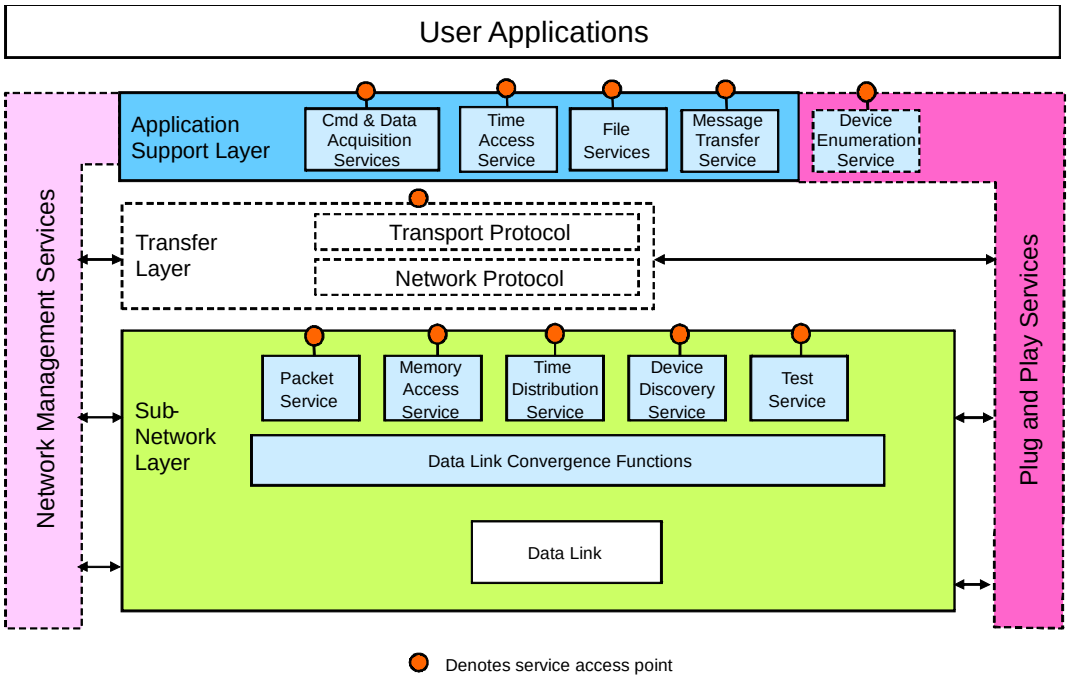

Figure 2-1: Subnetwork Device Discovery Service Context

2.3 ASSUMPTIONS

The following assumptions have been made in designing the SOIS Subnetwork Device Discovery Service:

- The SOIS Subnetwork Device Discovery Service is provided across single subnetworks.
- The SOIS Subnetwork Device Discovery Service is made available to protocol entities in the Transfer, Application Support, and User Application Layers.

2.4 QUALITY OF SERVICE

The Device Discovery Service operates with best-effort Quality of Service. This service makes a single attempt to provide the requested service but cannot ensure that it will be completed successfully.

Channel and Priority parameters are not provided in the Device Discovery Service. Were a subnetwork to provide channelisation and prioritisation to users of other subnetwork services, it would fall to the subnetwork Management Information Base (MIB) to set default channel and priority levels to ensure that the Device Discovery Service adhere to an overall subnetwork prioritisation and resource-reservation scheme.

3 SUBNETWORK DEVICE DISCOVERY SERVICE

3.1 SERVICE PARAMETERS

The parameters of the Subnetwork Device Discovery Service are defined below:

Source Subnetwork Service Access Point (SSNSAP)

The SSNSAP identifies the SAP of the user entity that is the recipient of a Device Discovery Service indication. In the case of service invocation by a user entity the same SSNSAP identifies the invoking user entity.

Destination Address

The Destination Address identifies a data system connected to the subnetwork. Reserved Destination Address values are controlled by reference [3].

3.2 DEVICE DISCOVERY SERVICE PRIMITIVES

3.2.1 GENERAL

In this subsection the service primitives for the SOIS Subnetwork Device Discovery Service are presented.

There are two primitives used by this service:

– DEVICE_DISCOVERY.request which requests that device identities be retrieved from the subnetwork;

– DEVICE_DISCOVERY.indication which returns device identities.

3.2.2 DEVICE_DISCOVERY.REQUEST

3.2.2.1 Function

The **DEVICE_DISCOVERY.request** primitive requests the service to retrieve device addresses from the subnetwork.

3.2.2.2 Semantics

DEVICE_DISCOVERY.request (SSNSAP)

3.2.2.3 When Generated

The **DEVICE_DISCOVERY.request** primitive shall be passed to the SOIS Subnetwork Device Discovery Service provider to request that device subnetwork addresses be retrieved.

3.2.2.4 Effect on Receipt

Receipt of the **DEVICE_DISCOVERY.request** primitive shall cause the SOIS Subnetwork service provider to retrieve the subnetwork addresses of data systems on the subnetwork.

3.2.2.5 Additional Comments

SSNSAP identifies the invoking user entity.

3.2.3 DEVICE_DISCOVERY.INDICATION

3.2.3.1 Function

The **DEVICE_DISCOVERY.indication** is used to pass subnetwork addresses of devices and data systems to the user entity.

3.2.3.2 Semantics

DEVICE_DISCOVERY.indication (SSNSAP, Address)

3.2.3.3 When Generated

This primitive is issued by the service provider to the receiving application on receipt of subnetwork information pertaining to data system addresses. This may be in response to a DEVICE_DISCOVERY.request or as a result of internal subnetwork mechanisms. Multiple instances of DEVICE_DISCOVERY.indication may arise as a result of a DEVICE_DISCOVERY.request invocation.

3.2.3.4 Effect on Receipt

The response of the user entity to a **DEVICE_DISCOVERY.indication** primitive is unspecified.

3.2.3.5 Additional Comments

In the case of a solicited device discovery, the SSNSAP identifies the invoking user entity.

The Address parameter is a subnetwork address.

4 MANAGEMENT INFORMATION BASE

There is currently no Management Information Base associated with this service. All management items are associated with the protocol providing the service. Any protocol claiming to provide this service in a SOIS-compliant manner shall publish its Management Information Base as part of the protocol specification.

5 SERVICE CONFORMANCE STATEMENT PROFORMA

It is mandatory that, for any protocol implementation claiming to provide this service, this proforma be completed giving details of the capabilities of the implementation.

Service Conformance Statement **SOIS Subnetwork Device Discovery Service**

Implementation Information

Implementer Identification	
Implementation Identification	
Version	
Underlying Data Link	
Protocol Identifier	

Mandatory Features

DEVICE_ DISCOVERY.indication	√

Optional Features

DEVICE_ DISCOVERY.request	

Additional Information

ANNEX A

INFORMATIVE REFERENCES

[A1] *Spacecraft Onboard Interface Services*. Report Concerning Space Data System Standards, CCSDS 850.0-G-1. Green Book. Issue 1. Washington, D.C.: CCSDS, June 2007.

NOTE – Normative references are listed in 1.8.